

US EPA ARCHIVE DOCUMENT



A Multi-Program Approach to Identifying and Correcting Anthropogenic Bacteria Sources

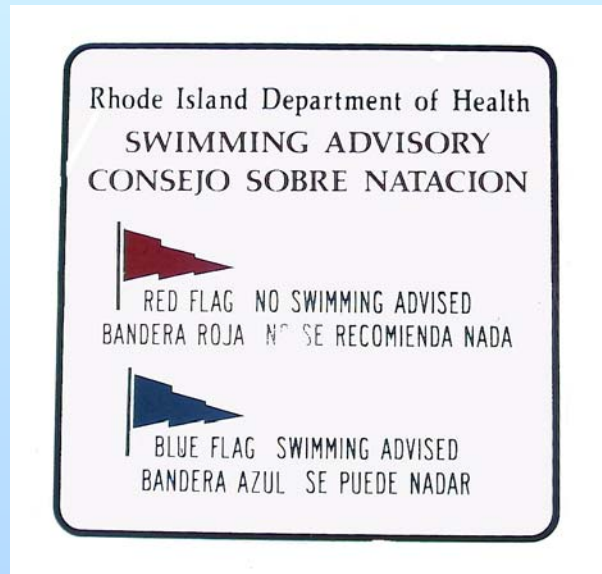


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Rhode Island DEM, Office of Water Resources
Surface Water Assessments

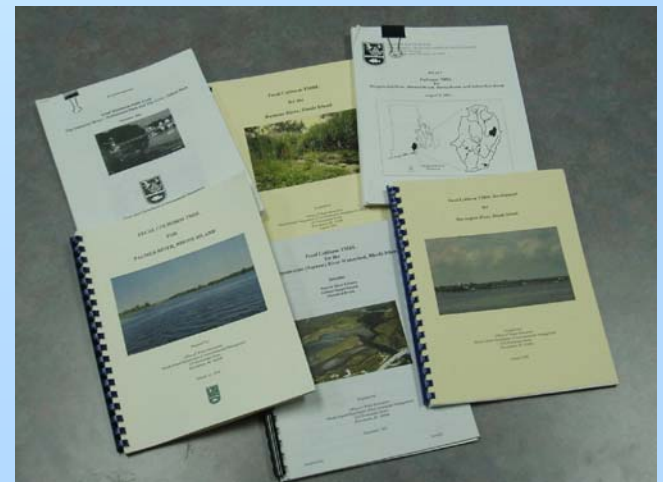
Bacteria Impairments

- Shellfish Closures
- Safe Swimming



Impaired Waters in Rhode Island

- 2008 303(d) List
 - 141 Assessment Units (WBID#s) representing 112 waterbodies (unique waterbody names) with 196 impairments.
- Completed RI TMDLs
 - 43 Bacteria Impairments (24 Other Impairments)

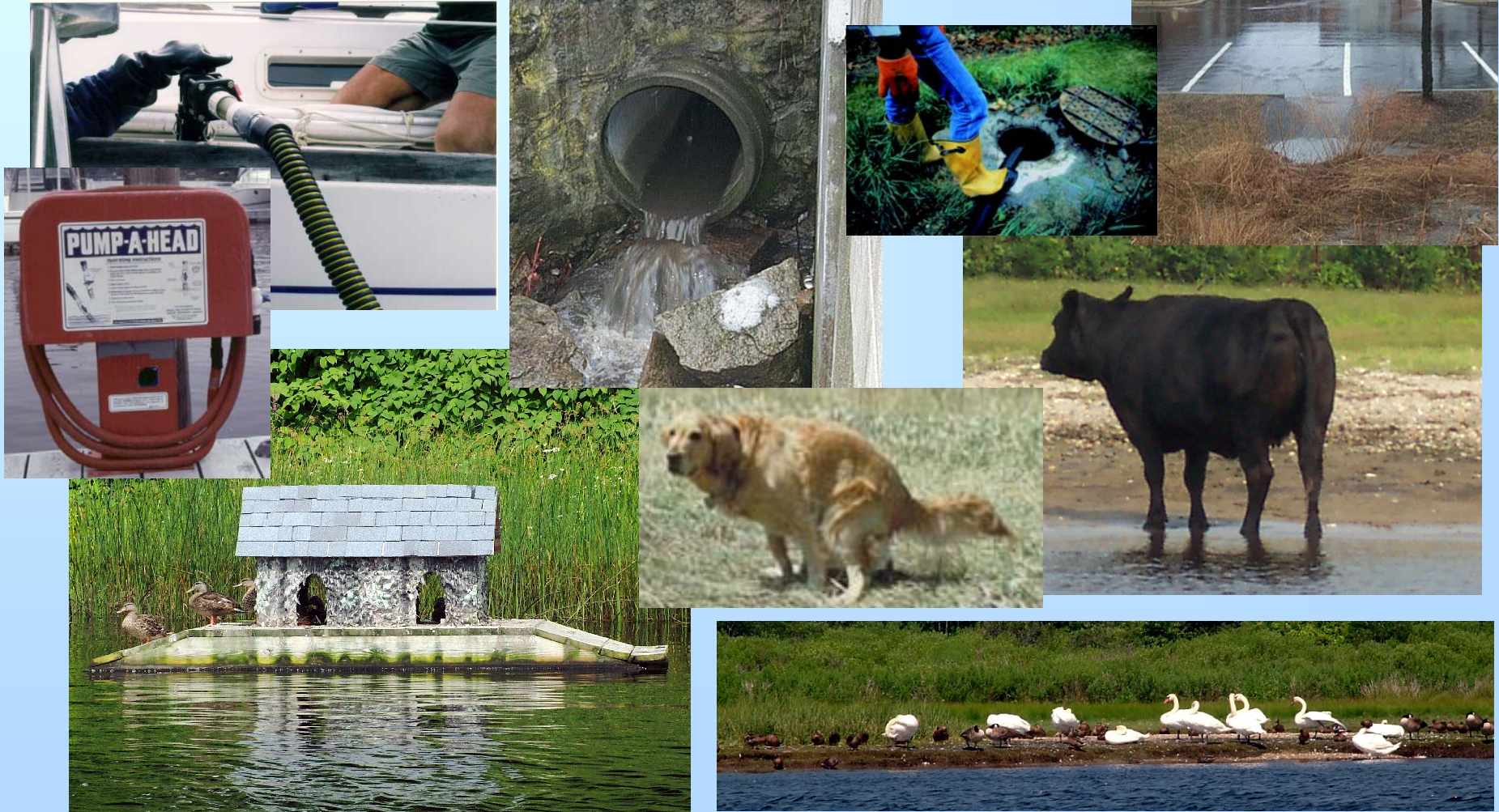


TMDL Development

Ambient water sampling to characterize water quality conditions and to identify pollution sources.

- Dry and wet weather sampling.
- Sampling of tributaries and other selected sources (using fecal coliform and bacteriophage).
- Sampling stations selected to bracket suspected sources.
- Source inventory using shoreline surveys and/or MS4 outfall mapping.

Potential Bacteria Sources



Male-Specific Bacteriophage (MSB)

- Viral Indicator
 - Relatively inexpensive that can be analyzed at local laboratories.
- A tool for distinguishing human versus non-human bacteria sources.

Waste Type	No. of Samples	Detection by Direct-Plating Method (%)	Range (pfu/g) ^a
Human Feces	13	0.0 (0)	<1.0 - 6.25
Residential Lift Station	22	2 (9)	<50.0 - 2.5X10 ⁴
Sewage Plant Effluent	14	11 (79)	<100 - 2.1X10 ⁵
Septage	17	10 (59)	<10 - 1X10 ⁶
In-Line Sewage	11	11 (100)	<4.5X10 ³ - 8.7X10 ⁵
Sewage Plant Influent	14	14 (100)	<8.5X10 ⁴ - 3.4X10 ⁶

^aphage forming units per gram

Occurrence of Male-Specific Bacteriophage in Feral and Domestic Animal Wastes, Human Feces, and Human-Associated Wastewaters (Kevin R Calci et al, 1998)

- Thresholds for further investigations.



Shellfish Program Shoreline Surveys

Digital Pictures



Bacteria Samples



Flow Estimates (Bucket, Flow Meter, Yard Stick with Ping Pong Ball, etc.)

Record Information



River Bend Cemetery

Pawcatuck River Shoreline Survey RI Area # 1 RR Bridge to Margin St Date: 8/1/06 RI Team # 1

Team Members: Skip V. / Greg G.

Weather Conditions Sunshine, humid Tidal Stage low Days Since / Amount Rainfall / Page 1 Of 5

Material Types: C - Concrete CMP - Corrogated Metal Pipe CI - Cast Iron PVC - Plastic Strm - Stream CULV - Culvert VC - Vitrified Clay

OB - Orange Berg Other - Describe

Source ID	Latitude 41° (Dec. Min.)	Longitude 71° (Dec. Min.)	Description and Location	Actual / Potential	Direct / Indirect	Flow (<u> </u> per sec.)	Source Dimensions (Width or Dia. X Stage)	Time	Results
2006-12-1-RI100	22.198'	49.908'	Storm Drain Picture: 4715	A	D	See notes	48" C Pipe	9:05	1600/ 410
2006-12-1-RI101	22.373'	49.896'	Storm Drain Picture: 4718-4719	A	D	See notes	36" C Pipe (right) ^{South}	9:28	71600/ 480
2006-12-1-RI102	22.373'	49.896'	Storm Drain Picture: 4718-4719	A	D	See notes	36" C Pipe (left) ^{North}	9:30	71600/ 347
2006-12-1-RI103	22.659'	49.881'	Storm Drain under Bridge Picture: 4732-4733	A	D	See notes	30" box outfall	10:07	1600/ 30
2006-12-1-RI114	22.310'	49.898'	Box Shaped outfall Picture: 4716	P	D	—	18" CMP	9:19	Grouped together
2006-12-1-RI115	22.354'	49.908'	Several outfalls Picture: 4717	P	D	—	18" CMP	9:19	
2006-12-1-RI116	22.354'	"	"	"	"	—	24" C	9:19	
2006-12-1-RI117	"	"	"	"	"	—	24" C	9:19	
2006-12-1-RI118	"	"	"	"	"	—	18" C	9:19	
2006-12-1-RI119	22.395'	49.914'	Storm Drain Picture: 4720	"	"	—	24" C	9:44 9:44	



Office of Compliance and Inspection

- Responsible for regulatory enforcement activities related to Air, Waste, and Water Resources.
- Coordinates with other DEM divisions and offices regarding their compliance monitoring of regulated, permitted or licensed activities and facilities.
- Issues formal enforcement actions against regulated facilities or activities when significant noncompliance is discovered by complaint investigation or compliance monitoring.
 - Formal enforcement includes orders and assessment of penalties that are subject to appeal and enforceable through the courts

OC&I Water Pollution Investigations

- Investigates complaints related to discharges of pollutants to surface waters or ground waters.

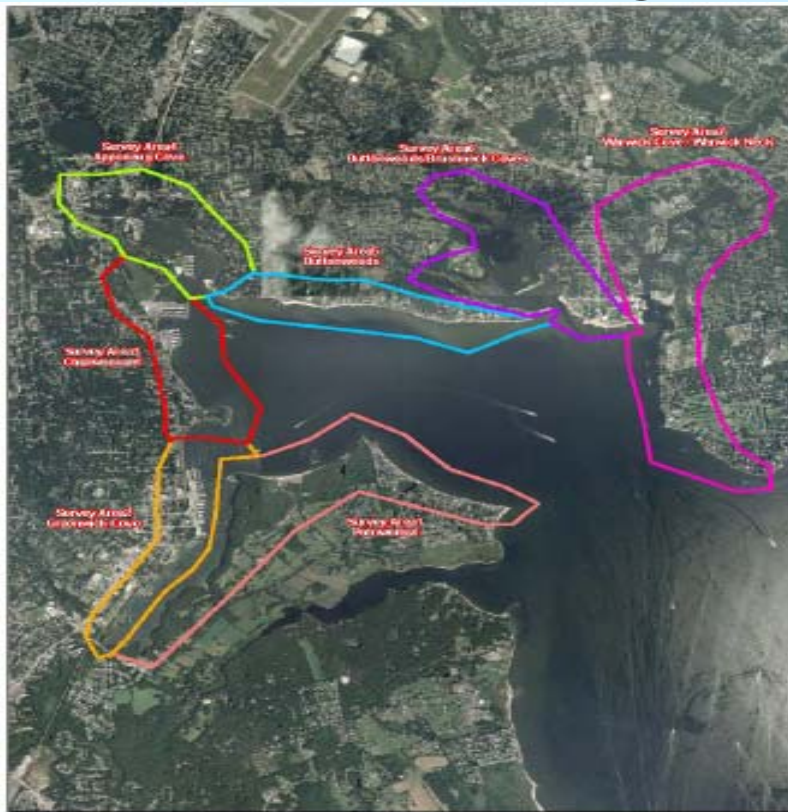
	2007	2006	2005
Complaints	149	188	189
Investigations	166	204	155
Number of Complaints Determined to be Unfounded	109	168	134
Percent Complaints Determined to be Unfounded	73%	89%	71%
Personnel Available for WQ Investigations (FTE)	1	1.2	1.2

Case Studies

- Greenwich Bay
- Pawcatuck River
- Blackstone River

Greenwich Bay

2005 Multi-Agency Shoreline Survey



- FDA NSSP requires RI to conduct a sanitary survey every twelve years.
- Shoreline Survey
 - Walk or Boat entire Shoreline.
 - Six Teams
 - Two Days
 - 27 Miles of Shoreline

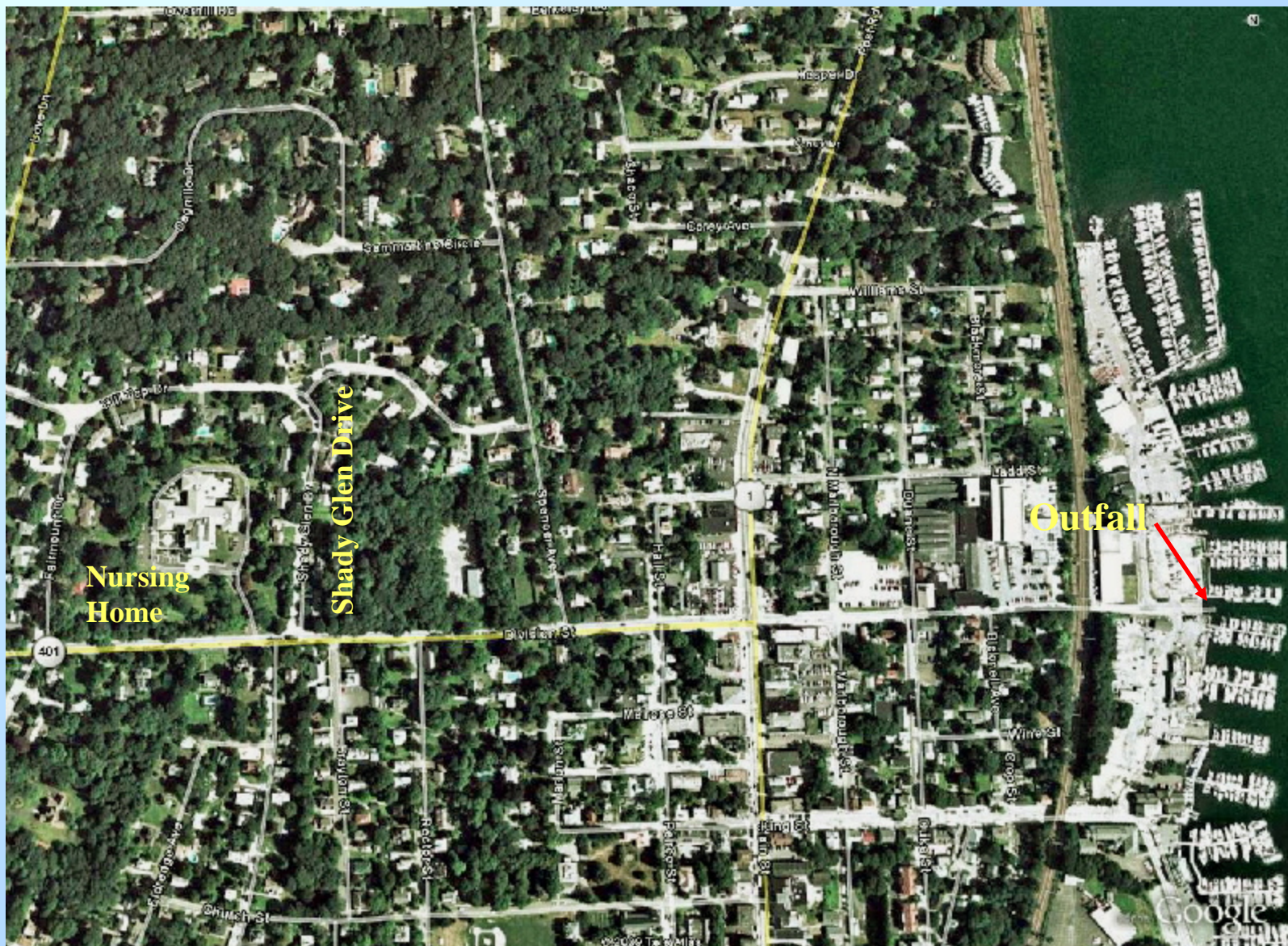
Source Sampling Results

- Dry Weather Survey
- 17 sources exceeded 240 fc/100ml
- 11 of these 17 were re-sampled during the shoreline survey due to high fecal coliform bacteria or high male-specific bacteriophage results.
- 3 sources were forwarded to OC&I for further investigation.
 - Division Street Outfall
 - Norton's Marina Outfall
 - Chepiwanoxet Point Outfall

Division Street

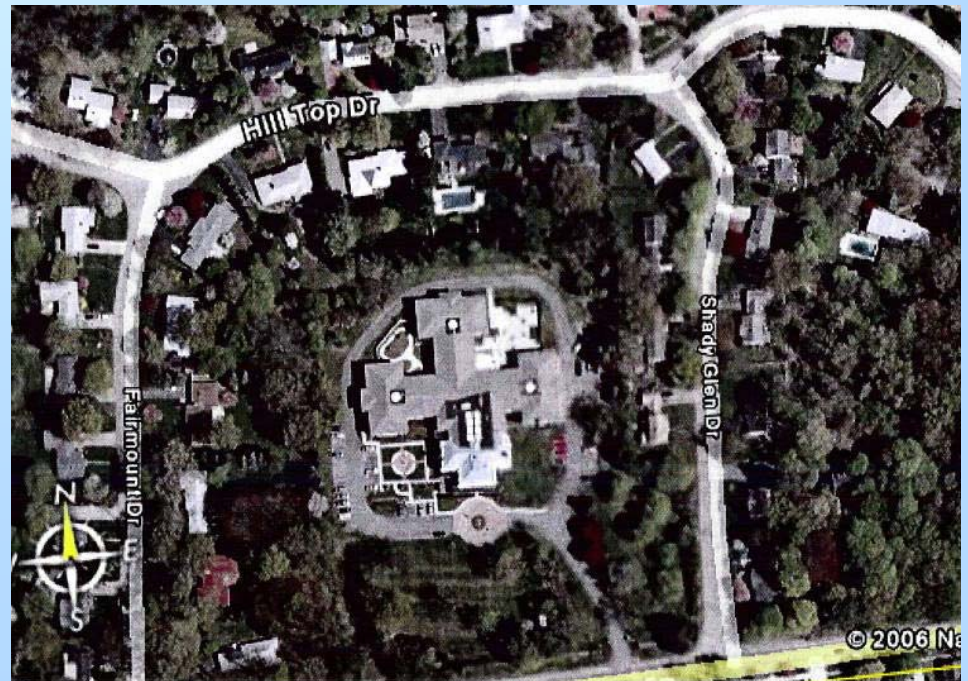
- May 2005 Results
 - Fecal coliform ranged from 103 to 3800 fc/100ml.
 - Bacteria phage ranged from **70** to **520** pfu/100ml.
- OCI Investigation
 - Outfall owned by DOT, but areas of East Greenwich and Warwick drain into the outfall.



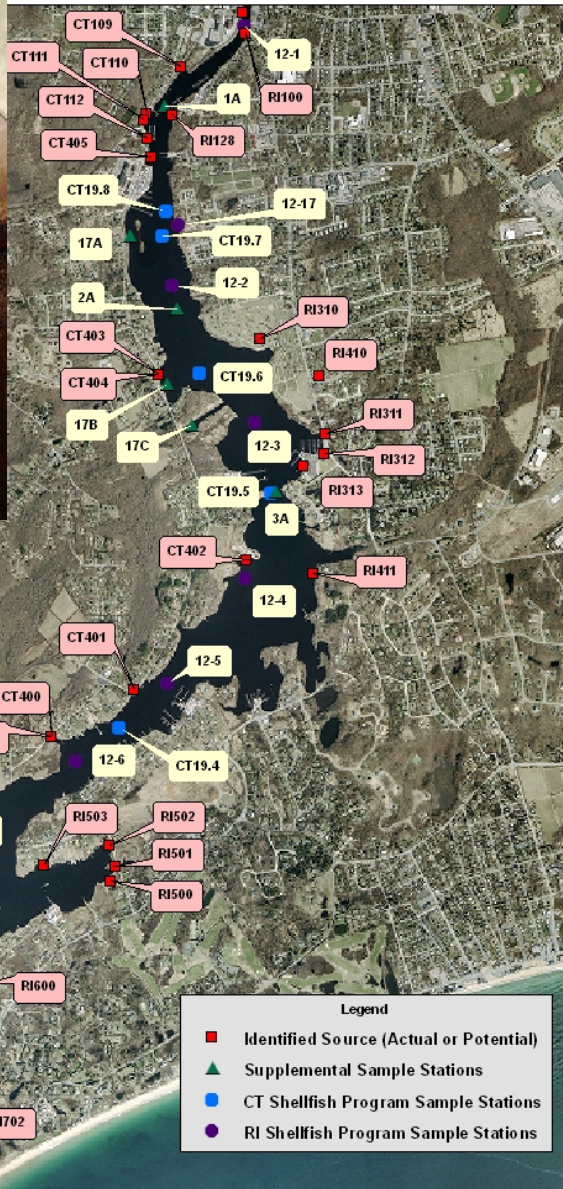


Outcome of OCI Investigations

- Neighborhoods using under drains that discharge to the storm drain.
- Nursing Home
- Shady Glen Drive
 - Dye Tests



Pawcatuck River 2006 Multi-Agency Bacteria Study



- Sixteen instream stations sampled.
- Fifty-six potential bacteria sources identified with eleven sampled.
- Westerly WWTF, Pawcatuck WWTF, and freshwater Pawcatuck River sampled over several days.
- Shellfish meats sampled from four locations.

Source Sampling Results

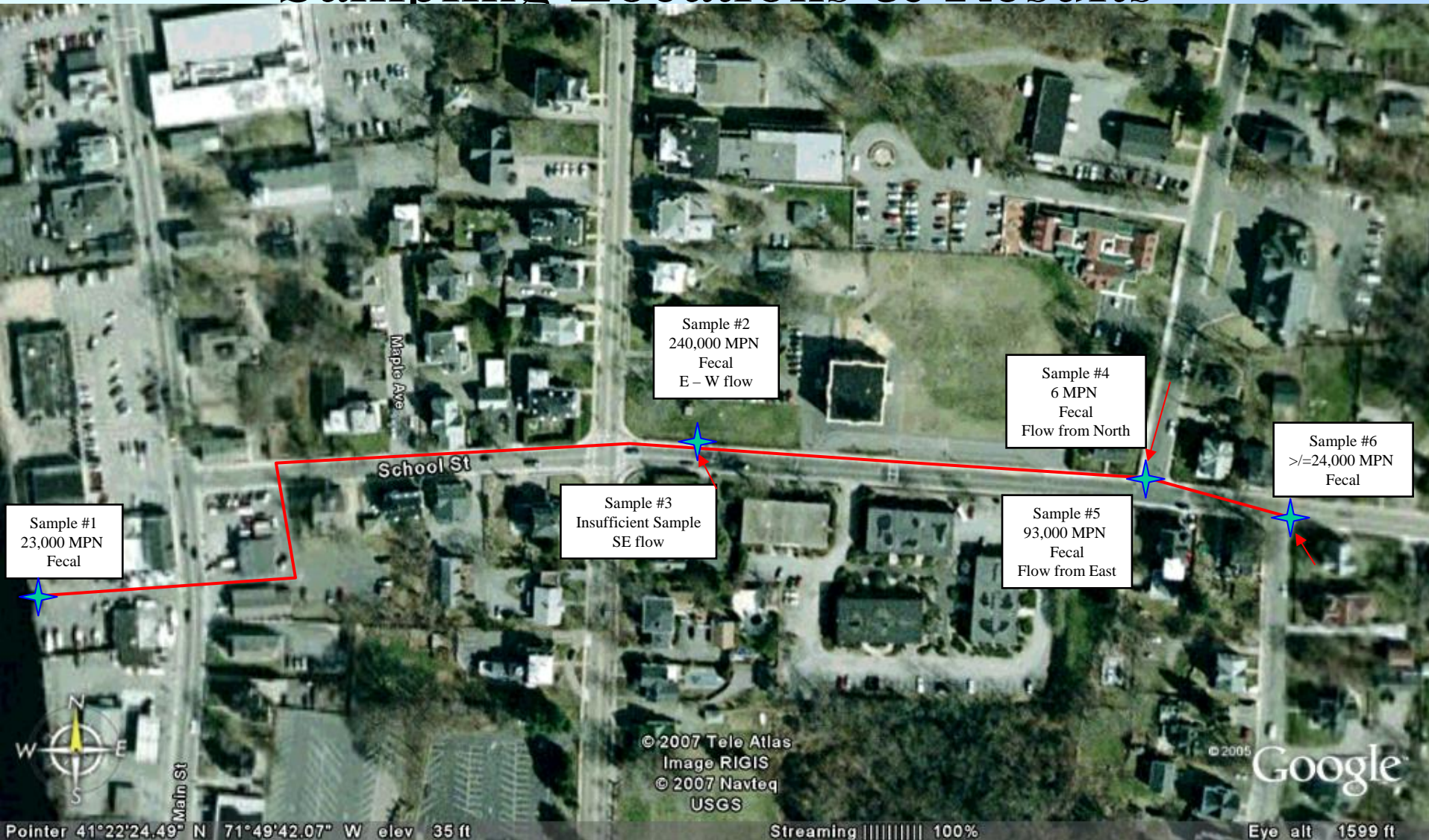
Source ID	Description	8/1/2006			8/3/2006		
		Est. Discharge (L/Sec)	Fecal Colifom	Phage	Est. Discharge (L/Sec)	Fecal Colifom	Phage
RI100	48" C Pipe	1.72	1600	<10	1.52	9200	10
RI101	36" C Pipe (South-Right)	4.08	>1600	480	0.71	5400	310
RI102	36" C Pipe (North-Left)	1.64	>1600	347	2.1	9200	550
RI103	30" Box Outfall	4.66	1600	30	4.46	5400	<10
RI313	6" Iron	Trickle	33	<10	NS	NS	NS
RI700	12" CMP	Trickle	17	<10	NS	NS	NS
CT102	42" C w/in 20' of Main St Bridge		>1600	<10		460	10
CT109	3' by 5' C Storm Drain	<1	79	20	NS	NS	NS
CT112	24" C	0.945	540	<10	NS	NS	NS
CT400	34" RCP Riverside Drive	~1.89	220	10	NS	NS	NS

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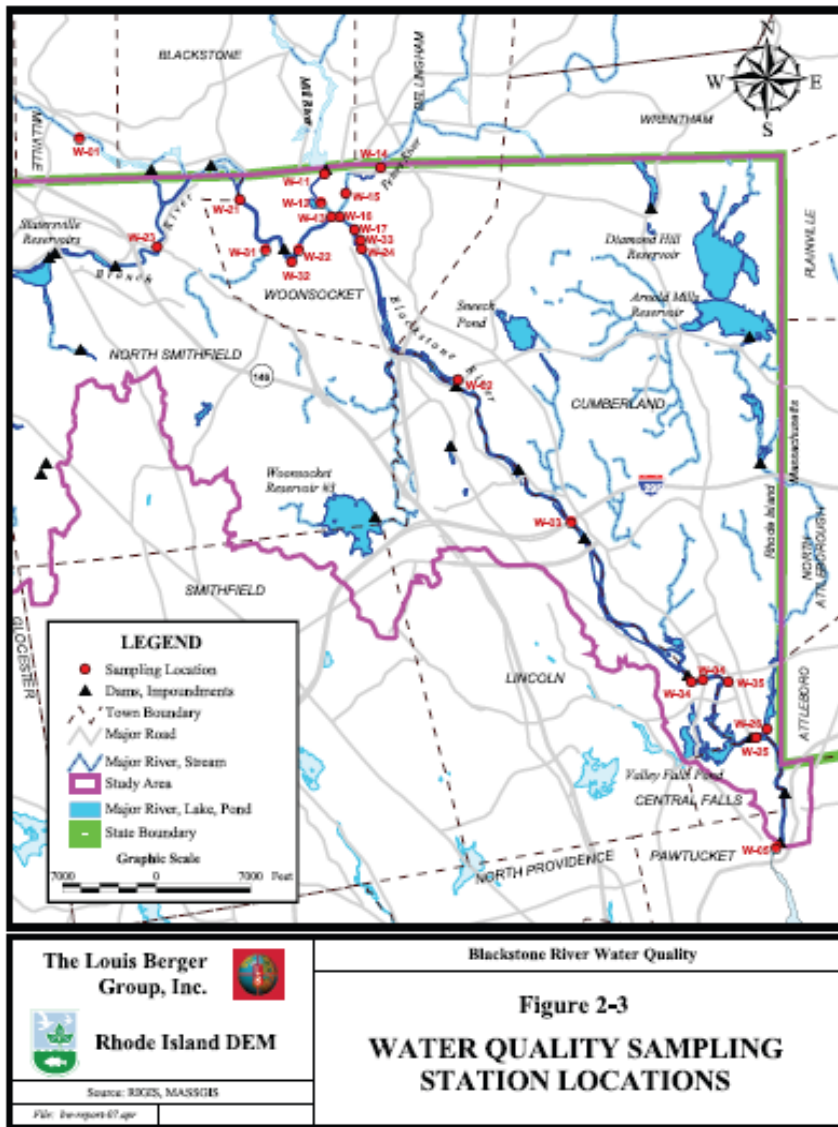
School St., Westerly, Storm Drain Sampling Locations & Results



Blackstone River

TMDL contractor Louis Berger Group, Inc. conducted a year-long assessment of water quality.

- Instream primary stations sampled at least once per month with secondary stations sampled less often.
- Larger sources including point sources also sampled.
- Parameters: pathogens, nutrients, metals, biodiversity monitoring, etc.



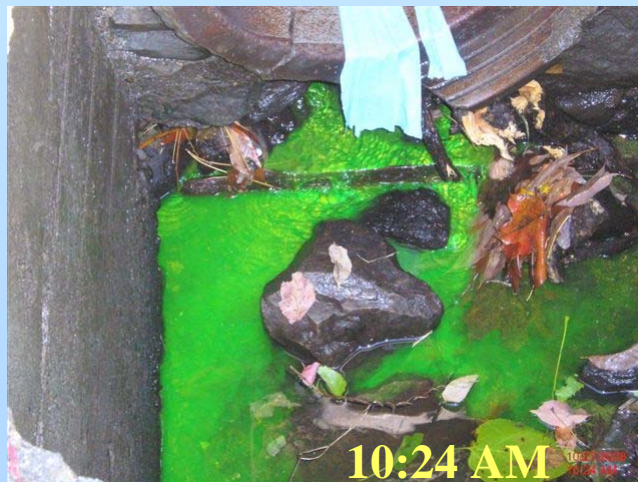
Blackstone River: Ann and Hope Outfall



	Fecal Coliform
11/29/2005	16,000
12/22/2005	2400
1/27/2006	>16,000
2/17/2006	5000

Dry Weather Discharge: 7.08 L/Sec

Dye Testing



Ann and Hope Outfall



Conclusions

- TMDL development focus on identifying pollution sources.
- Able to take advantage of other program's efforts:
 - Shellfish Program's Shoreline Survey
 - OCI's Investigations
- Successfully using BST tools to identify sewage sources.



DEM TMDL Program Website

<http://www.dem.ri.gov/programs/benviron/water/quality/rest/index.htm>

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